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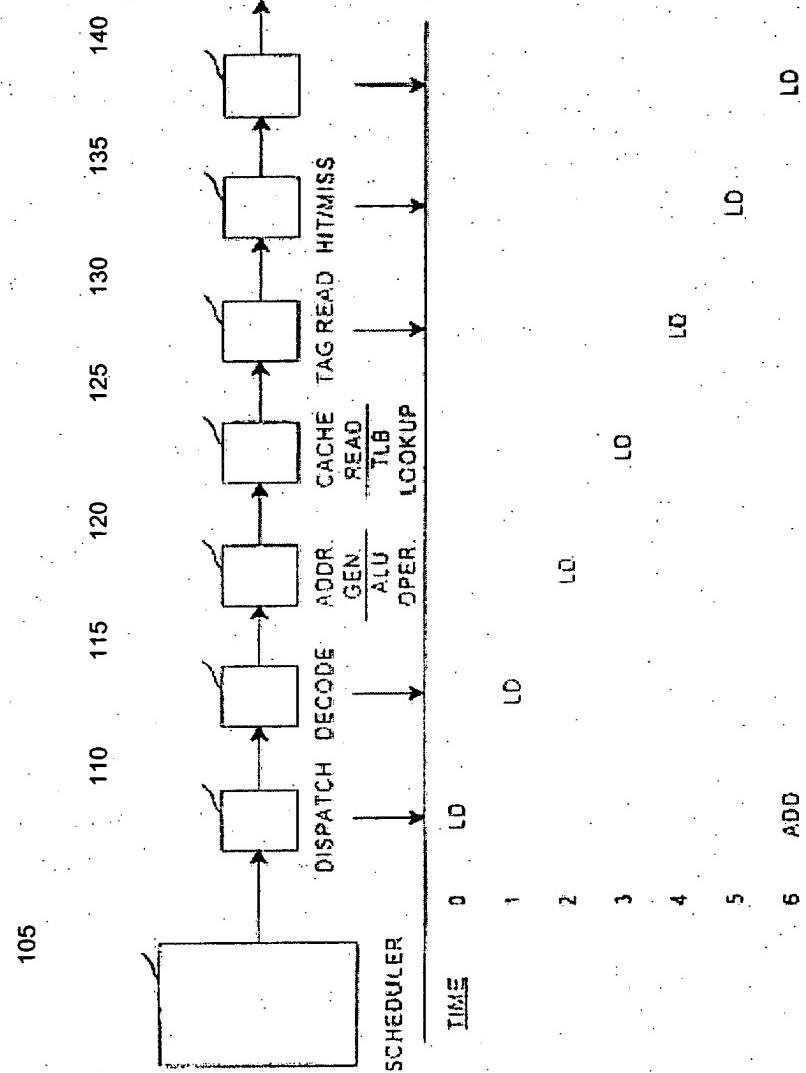


FIG.1  
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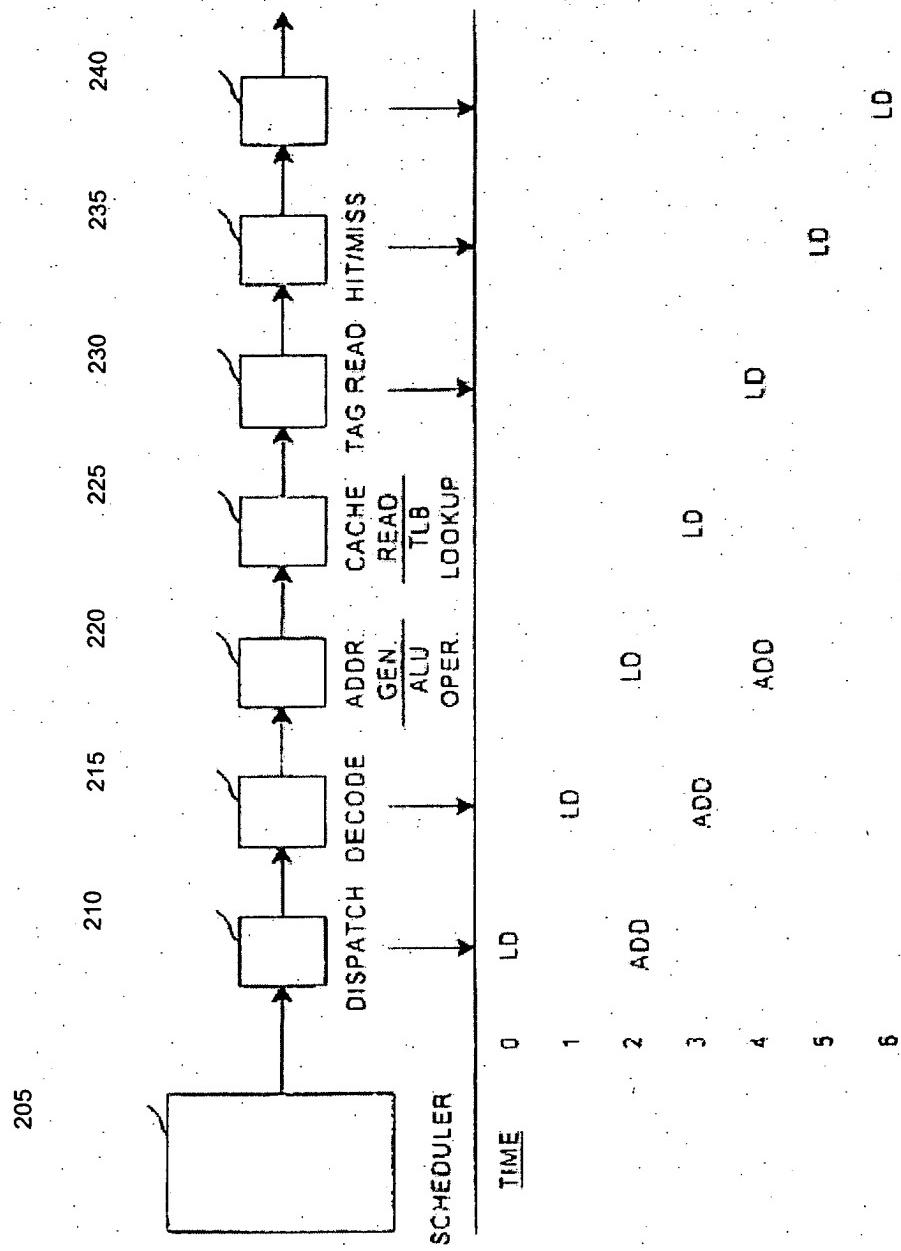
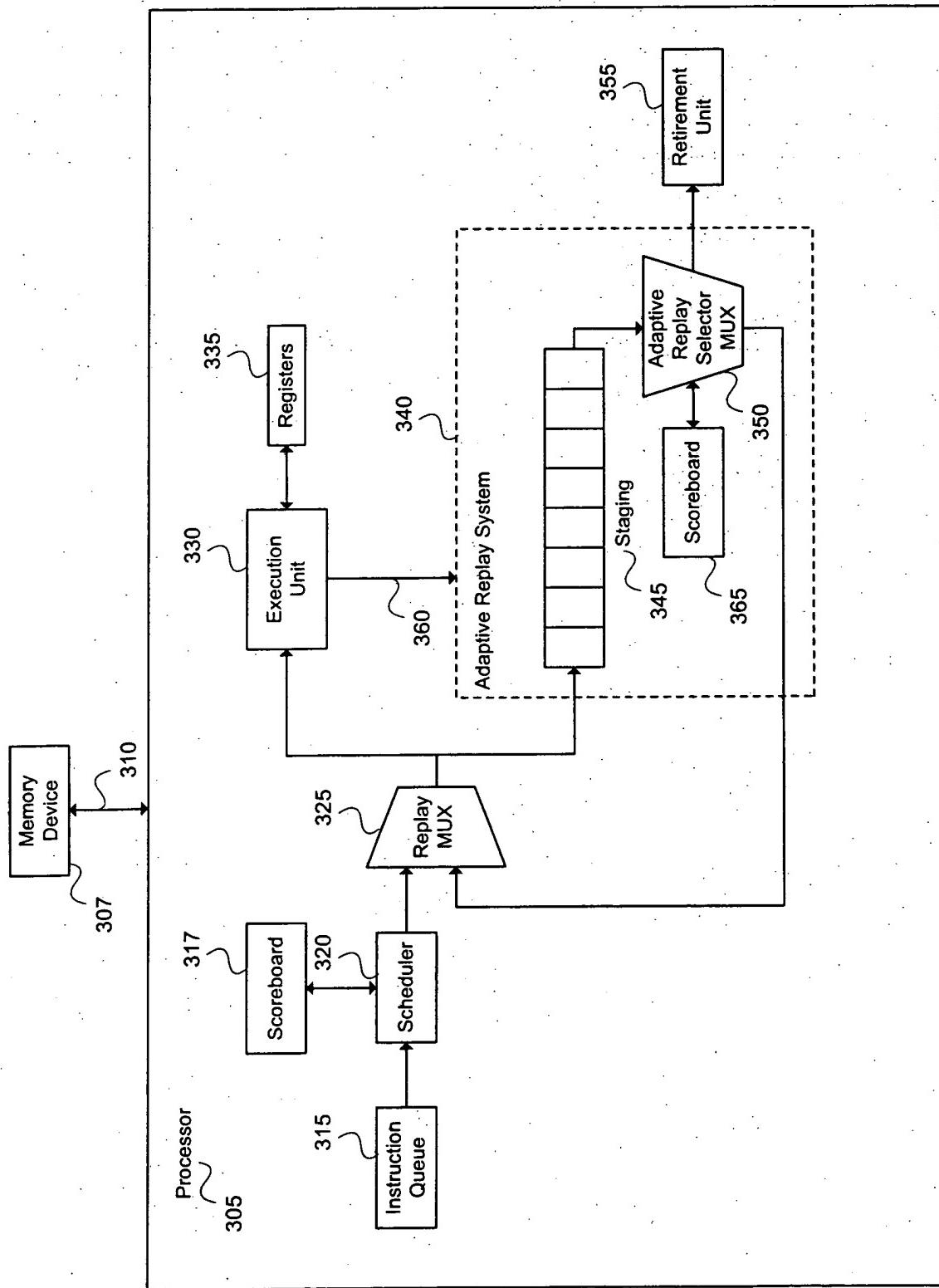


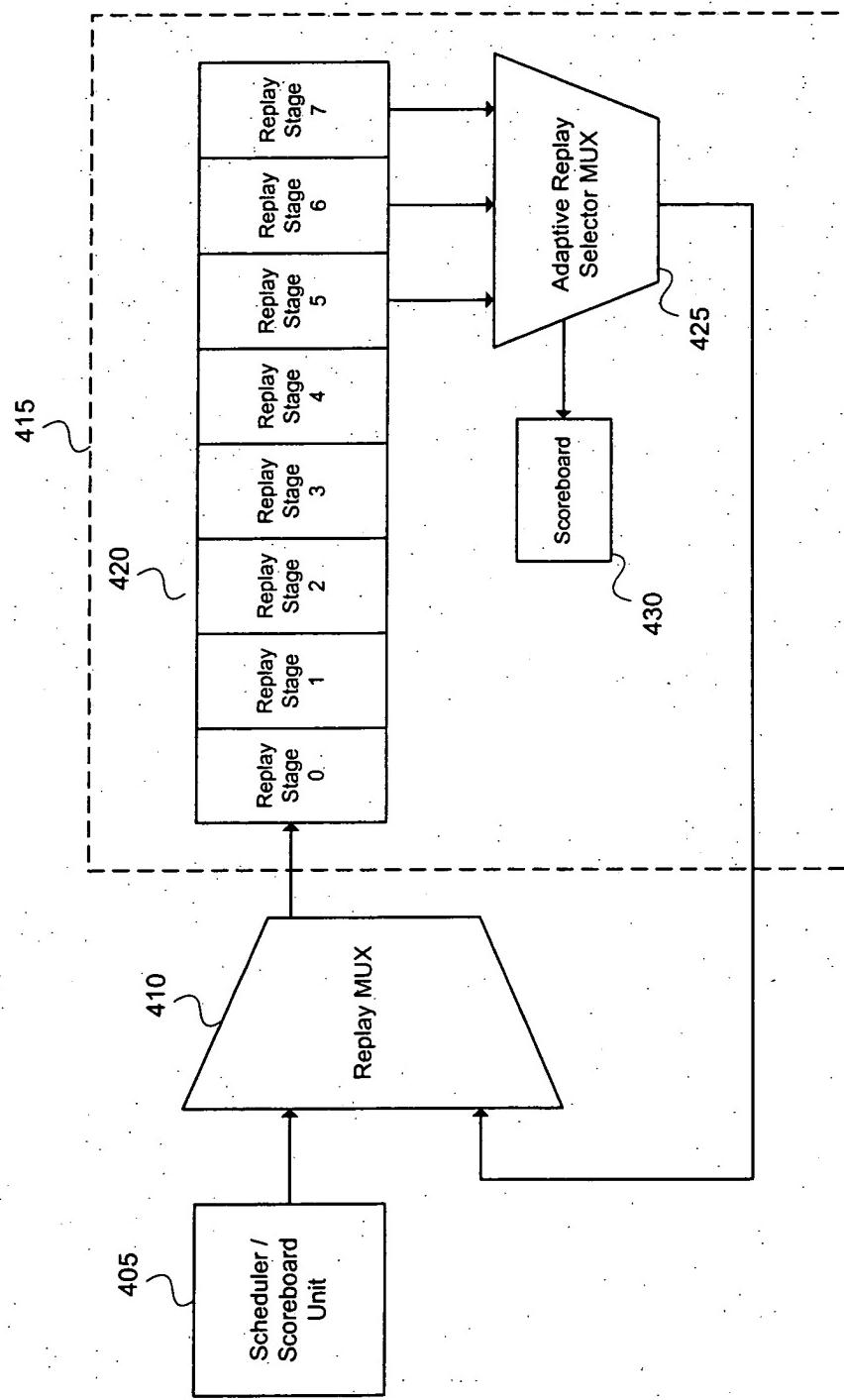
FIG.2

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**Fig. 3**

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**Fig. 4**

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Case 1: Uop late arrival

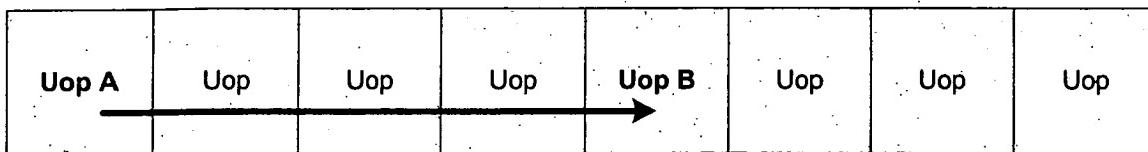


Fig. 5a

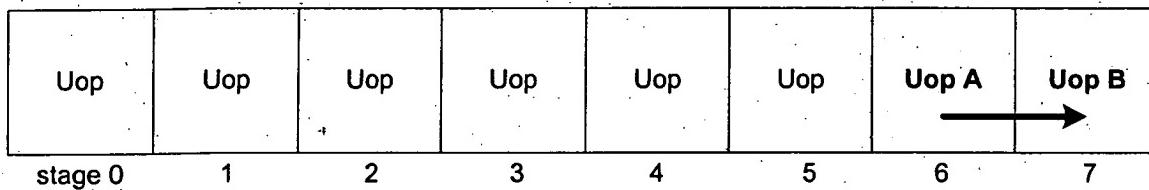


Fig. 5b

Case 2: Multiple active Uops

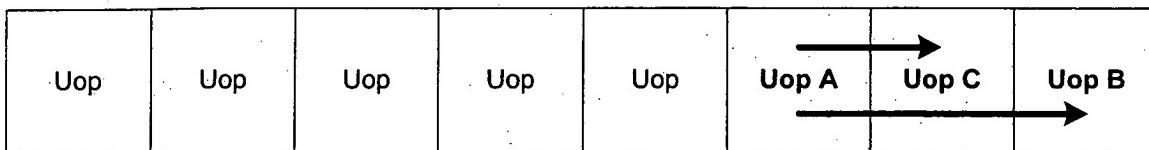


Fig. 6a

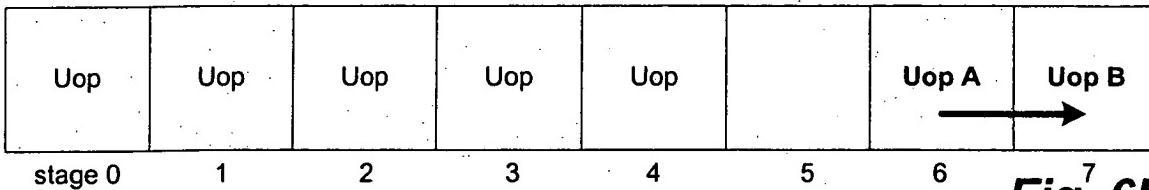


Fig. 6b

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Case 3: Resource conflicts

Uop	Uop	Uop	<b>Uop A</b>	Uop	Uop	Uop	Uop
Uop	Uop	Uop	<b>Uop B</b>	Uop	Uop	Uop	Uop

Fig. 7a

Uop	Uop	Uop	Uop	Uop	Uop	<b>Uop A</b>	Uop
Uop	Uop	Uop	Uop	Uop	Uop B	←	Uop

Fig. 7b

Uop	Uop	Uop	Uop	Uop	<b>Uop B</b>	<b>Uop A</b>	Uop
stage 0	1	2	3	4	5	6	7

Fig. 7c

Case 4: Uop goes replay safe.

Uop	Uop	<b>Uop A</b>	<b>Uop Z</b>	<b>Uop B</b>	Uop	Uop	Uop
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Fig. 8a

Uop	Uop	Uop	Uop	Uop	<b>Uop A</b>	hole	<b>Uop B</b>
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Fig. 8b

Uop	Uop	Uop	Uop	Uop	Uop	<b>Uop A</b>	<b>Uop B</b>
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stage 0      1      2      3      4      5      6      7  
Fig. 8c

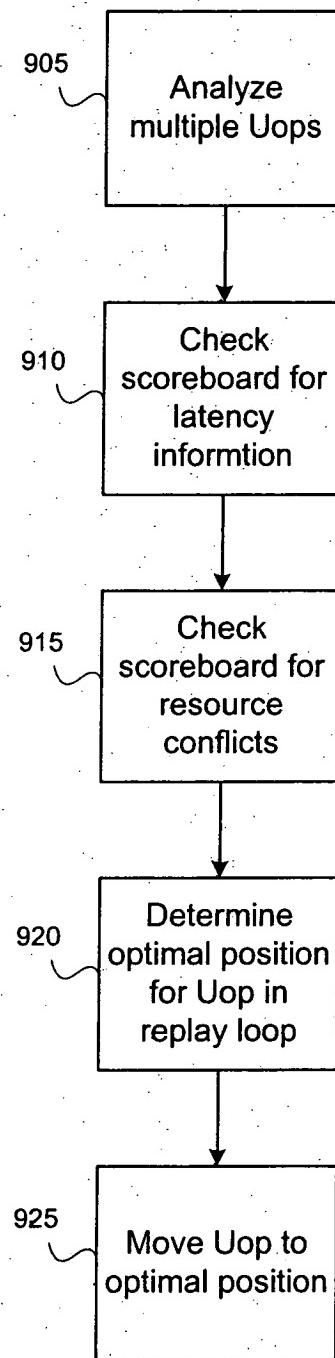


Fig. 9